CLAIMS

What is claimed is:

1. A multiple output illumination system comprising:

a first reflector having a first optical axis and a first and second focal points substantially on said first optical axis;

a second reflector having a second optical axis and a third and fourth focal points substantially on said second optical axis, said third focal point being substantially proximate to said first focal point and said fourth focal point being substantially distal from said second focal point;

a source of electromagnetic radiation substantially proximate to said first or said third focal points to produce first rays of radiation that are reflected substantially by said first reflector and converge substantially at said second focal point and to produce second rays of radiation that are reflected substantially by said second reflector and converge substantially at said fourth focal point;

a first light pipe having a first input end substantially proximate to said second focal point to be illuminated with at least a portion of said first rays of radiation; and

a second light pipe having a second input end substantially proximate to said fourth focal point to be illuminated with at least a portion of said second rays of radiation.

2. The multiple output illumination system of claim 1, comprising further an axis of rotation through a center of said source, and wherein said first and second reflectors are substantially rotationally symmetrical about said axis of rotation.

3. The multiple output illumination system of claim 1, wherein said second optical axis is substantially co-linear with said first optical axis.

4. The multiple output illumination system of claim 1, comprising further a third reflector having a third optical axis and a fifth and sixth focal points substantially on said third optical axis, said fifth focal point being substantially proximate to said first focal point and said sixth focal point being substantially distal from said second and fourth focal points.

5. The multiple output illumination system of claim 4, comprising further an axis of rotation through a center of said source, and wherein said first, second and third reflectors are substantially rotationally symmetrical about said axis of rotation.

6. The multiple output illumination system of claim 1, comprising further a fourth reflector having a fourth optical axis and a seventh and eighth focal points substantially on said fourth optical axis, said seventh focal point being substantially proximate to said first focal point and said eighth focal point being substantially distal from said second, fourth and sixth focal points.

7. The multiple output illumination system of claim 6, wherein each of said first, second, third, and fourth optical axes are directed substantially at a first, second, third, and fourth apices of a tetrahedron with a centroid substantially proximate to said source.

8. The multiple output illumination system of claim 1, wherein said first and second light pipes are tapered light pipes.

9. The multiple output illumination system of claim 1, wherein a shape of said first and second reflectors is selected from the group consisting of:

at least a portion of a substantially paraboloidal surface of revolution,

at least a portion of a substantially ellipsoidal surface of revolution,

at least a portion of a substantially toroidal surface of revolution, and

at least a portion of a substantially spheroidal surface of revolution.

10. The multiple output illumination system of claim 1, wherein said first reflector comprises a first primary and a first secondary reflector;

said first primary reflector having a first primary focal point substantially proximate to said first focal point and a first primary optical axis substantially co-linear with said first optical axis;

said first secondary reflector having a first secondary focal point substantially proximate to said second focal point and a first secondary optical axis substantially co-linear with said first optical axis; and

said second reflector comprises a second primary and a second secondary reflector;

said second primary reflector having a second primary focal point substantially proximate to said third focal point and a second primary optical axis substantially co-linear with said second optical axis; and

said second secondary reflector having a second secondary focal point substantially proximate to said fourth focal point and a second secondary optical axis substantially co-linear with said second optical axis.

11. The multiple output illumination system of claim 10, wherein said first and second primary reflectors or said first and second secondary reflectors comprise at least a portion of a substantially paraboloidal surface of revolution.

12. The multiple output illumination system of claim 10, wherein said first and second primary reflectors comprise at least a portion of a substantially ellipsoidal surface of revolution; and

said first and second secondary reflectors comprise at least a portion of a substantially hyperboloidal surface of revolution.

13. The multiple output illumination system of claim 10, wherein said first and second primary reflectors comprise at least a portion of a substantially hyperboloidal surface of revolution; and

said first and second secondary reflectors comprise at least a portion of a substantially ellipsoidal surface of revolution.

14. The multiple output illumination system of claim 1, comprising further a first and a second fiber optics;

said first fiber optic being illuminated by the radiation collected and condensed at said first light pipe, said first fiber optic releasing the collected and condensed radiation to provide for illumination at a desired location; and

said second fiber optic being illuminated by the radiation collected and condensed at said second light pipe, said second fiber optic releasing the collected and condensed radiation to provide for illumination at a desired location.

15. A multiple output illumination system comprising:

a first reflector having a first optical axis and a first focal point substantially on said first optical axis;

a second reflector having a second optical axis and a second focal point substantially on said second optical axis, said second focal point being substantially proximate to said first focal point;

a source of electromagnetic radiation substantially proximate to said first or said second focal points to produce first rays of radiation that are reflected substantially by said first reflector toward a first intermediate reflector and to produce second rays of radiation that are reflected substantially by said second reflector toward a second intermediate reflector;

a third reflector having a third optical axis and a third focal point substantially on said third optical axis receiving said first rays of radiation from said first intermediate reflector and substantially converging them toward said third focal point;

a fourth reflector having a fourth optical axis and a fourth focal point substantially on said fourth optical axis receiving said second rays of radiation from said second intermediate reflector and substantially converging them toward said fourth focal point;

a first light pipe to be illuminated with at least a portion of said first rays of radiation, said first light pipe having a first input end substantially proximate to said third focal point; and

a second light pipe to be illuminated with at least a portion of said second rays of radiation, said second light pipe having a second input end substantially proximate to said fourth focal point.

16. The multiple output illumination system of claim 15, wherein said first and second light pipes are tapered light pipes.

17. The multiple output illumination system of claim 15, wherein said second optical axis is substantially co-linear with said first optical axis.

18. The multiple output illumination system of claim 15, wherein said third optical axis is substantially parallel to said fourth optical axis.

19. The multiple output illumination system of claim 15, wherein said third optical axis is substantially normal to said first optical axis.

20. The multiple output illumination system of claim 15, wherein said fourth optical axis is substantially normal to said second optical axis.

21. The multiple output illumination system of claim 20, wherein said second, third, and fourth optical axes are substantially parallel to said first optical axis.

22. The multiple output illumination system of claim 15, wherein a shape of said first, second, third, or fourth reflectors is selected from the group consisting of:

at least a portion of a substantially paraboloidal surface of revolution,

at least a portion of a substantially ellipsoidal surface of revolution,

at least a portion of a substantially toroidal surface of revolution, and

at least a portion of a substantially spheroidal surface of revolution.

23. The multiple output illumination system of claim 15, comprising further a a third intermediate reflector receiving said first rays of radiation from said first intermediate reflector and reflecting them toward said third reflector; and

a fourth intermediate reflector receiving said second rays of radiation from said second intermediate reflector and reflecting them toward said fourth reflector.

24. A method for collecting electromagnetic radiation emitted by a source of electromagnetic radiation and substantially focusing the collected radiation onto a plurality of targets, the method comprising the steps of:

positioning said source of electromagnetic radiation substantially at a focal point of a first and a second reflectors;

producing first and second rays of radiation by said source;

reflecting said first rays of radiation by said first reflector substantially toward a third reflector and reflecting said second rays of radiation by said second reflector substantially toward a fourth reflector;

converging said first rays of radiation substantially at a focal point of said third reflector and converging said second rays of radiation substantially at a focal point of said fourth reflector;

positioning a first light pipe having an input end and an output end so that said input end is substantially proximate to said focal point of said third reflector;

collecting a substantial portion of said first rays of radiation at said input end of said first light pipe;

positioning a second light pipe having an input end and an output end so that said input end is substantially proximate to said focal point of said fourth reflector;

collecting a substantial portion of said second rays of radiation at said input end of said first light pipe;

positioning a first optical fiber substantially proximate to the output end of the first light pipe and positioning a second optical fiber substantially proximate to the output end of the second light pipe.

25. The method for collecting electromagnetic radiation of claim 24, wherein said first and second reflectors comprise at least a portion of a substantially paraboloidal surface of revolution.

26. The method for collecting electromagnetic radiation of claim 24, wherein said first and second reflectors comprise at least a portion of a substantially ellipsoidal surface of revolution.